



## Causes and Classification of Pneumonia in Newborn

1. Tuxtayeva Mashxura  
Muhiddinovna

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<sup>1</sup> Samarkand State Medical Institute,  
Assistant of the Department of  
Propaedeutics of Children's Diseases,  
Samarkand, Uzbekistan

**Abstract:** The article deals with the main problems of practical neonatology. The incidence is about 1% among full-term newborns and up to 10% among preterm infants. In infants who were on long-term mechanical ventilation immediately after birth, the prevalence of nosocomial pneumonia is up to 40-45%. Inflammation of the lungs is considered as the main cause or concomitant factor in up to 25% of deaths in the neonatal period. According to Rosstat, infant mortality from pneumonia reaches 7.5%.

**Key words:** pneumonia, newborns, causes, classification, diagnosis, pathogenesis, treatment, prevention.

### Introduction

A newborn's own immunity is extremely low, and all organ systems are in a state of transient adaptive reactions and have not yet adapted to changing conditions after birth. Therefore, infants are very susceptible to any kind of infection, which mainly affects the skin and respiratory tract. The etiological structure of neonatal pneumonia differs from that in older children and adults. Specific causes depend on the route of infection:

- Transplacental. In the womb, a child is more likely to encounter infections of the TORCH complex, which have a tropism for the epithelium of the respiratory tract - with rubella, toxoplasmosis, herpes simplex and cytomegalovirus. In rare cases, infection with syphilis and tuberculosis occurs.
- Intranatal. During childbirth, the main route of infection is contact, which is realized when passing through the maternal birth canal. If they are not sanitized, the newborn can become infected with chlamydia, E. coli mycoplasma and ureaplasma. More often than others, chlamydial pneumonia occurs (33% of cases).
- Postnatal. After birth, infection of an infant can occur in a hospital, especially if he is undergoing invasive manipulations or oxygen support. Here, Staphylococcus aureus, Pseudomonas aeruginosa, influenza and parainfluenza viruses come to the fore. Causes of postnatal pneumonia also include fungi of the genus Candida, adenoviruses, Mycobacterium tuberculosis.

The main predisposing factor for pneumonia in newborns is prematurity, which increases the risk of the disease 10 times. In second place are respiratory disorders requiring intubation and the use of mechanical ventilation. The frequency of pneumonia increases in children with congenital anomalies of the respiratory tract. Pulmonary inflammation is promoted by gastroesophageal reflux, in which aspiration syndrome often develops and pathogenic bacteria enter the respiratory tract.

### Pathogenesis

In most cases, neonatal pneumonia is characterized by bilateral damage to the interstitial tissue and alveoli, which causes severe hypoxic disorders and associated acidosis. The combination of hypoxemia and acid-base imbalance provokes multiple organ failure. First of all, the cardiovascular system suffers, and in severe cases, other organs - the kidneys, liver, brain.

Regardless of the cause, pneumonia in newborns occurs in 3 stages. First, infiltration occurs (the first week of the disease), when the peripheral parts of the lungs are predominantly affected. In the second week, the resorption stage begins, characterized by a decrease in the percentage of dark areas and an increase in pneumatization. In the third week, the stage of interstitial changes and deformation of the lung pattern begins.

### Classification

Depending on the cause, newborns are isolated bacterial, viral, fungal or protozoal forms of the disease. If the pathology occurs in the absence of other foci of infection in the body, it is called primary. Secondary inflammation of the lungs is formed with aspiration syndrome, sepsis. In modern neonatology, the classification of pneumonia according to the time of development into 2 groups is important:

- Congenital. In this case, infection occurs ante- or intranatally, and the first clinical signs are determined within 3 days after delivery. Common causes of congenital inflammation are intrauterine infections.
- Acquired (postnatal). Infection with pathogenic microbes occurs in the maternity hospital (nosocomial form) or after the baby is discharged (community-acquired form). Symptoms are detected 72 hours after the birth of the child, but no later than 28 days of life.

### Symptoms of pneumonia in newborns

In newborns, pneumonia is predominantly manifested by nonspecific respiratory disorders. There is frequent and noisy breathing, accompanied by "grunting sounds". At the same time, the wings of the nose swell, the intercostal and supraclavicular spaces are retracted. The skin around the mouth and on the fingertips turns blue, with an increase in respiratory failure, total cyanosis is noted.

Cough in a newborn is usually absent. Mucus or foam with an unpleasant odor periodically comes out of the mouth. Symptoms are supplemented by general signs: refusal to suckle the breast, fever, pathological excitability or depression of the central nervous system. In the neonatal period, pneumonia is accompanied by infectious toxicosis, which is characterized by a gray skin tone, hemorrhagic rash, jaundice and hepatosplenomegaly.

### Complications

The disease can lead to pulmonary edema, purulent-destructive processes (abscesses, bullae, gangrene), pyopneumothorax. Prolonged respiratory disorders in newborns provoke hypoxic encephalopathy, cardiopathy, nephropathy. Pneumonia is most severe in premature babies: they often end in generalization of infection and sepsis, and in 40% they cause death.

## Diagnostics

The neonatologist begins the examination by taking a history of the mother (the course of pregnancy and childbirth, extragenital pathologies) in order to suggest the causes of respiratory disorders in the newborn. Physical findings are not informative because wheezing and crepitus are much more difficult to detect on auscultation in infants. Respiratory disorders are assessed on the Silverman or Downs scale. The main diagnostic methods for verifying possible pneumonia in newborns are:

- Radiography of OGK. The main method that shows focal or total darkening in the lungs, the state of the pleural sinuses, the presence of signs of RDS in the form of "ground glass". In the pictures, the doctor can detect congenital malformations of the respiratory system, which have become a predisposing factor in the disease.
- Microbiological research. To establish the infectious cause of pneumonia, bacteriological discharge from the pharynx, sputum, or tracheobronchial aspirate is performed. The obtained microorganisms are examined for sensitivity to antibiotics. If sepsis is suspected, blood cultures are performed for sterility.
- Serological reactions. Determination of antibodies to congenital infections (cytomegalovirus, rubella) is necessary to determine the nature of pneumonia, if typical pathogens are excluded. When visualizing signs of the so-called "white" pneumonia on radiography, serological tests for syphilis (RSK, RIBT) are prescribed.
- Blood tests. Clinical and biochemical studies are recommended to identify markers of the inflammatory response that correlate with disease severity and prognosis. A high leukocyte index of intoxication and an increase in the level of CRP of more than 10 mg / l are considered unfavorable.

## Treatment of pneumonia in newborns

### *Conservative therapy*

Treatment of infants with pneumonia is carried out only in a hospital: in the neonatal pathology department or in the resuscitation and intensive care unit. The basis of treatment is antibiotics, which are first selected empirically, and then adjusted after receiving the results of bacteriological diagnostics. In neonatology, beta-lactam preparations and macrolides are mainly used. How pathogenetic methods are applied:

- Oxygen support. Ensuring normal saturation is the primary task of physicians, as this reduces the risk of metabolic and multiple organ disorders. Non-invasive ventilation (biphasic, CIPAP) is recommended, in severe cases the child is transferred to mechanical ventilation.
- Immunotherapy. To stimulate the newborn's own defenses, second-generation immunoglobulins are prescribed, which include a complex of IgG, IgM, IgA (pentaglobin).
- Infusion therapy. To replenish the BCC and correct electrolyte parameters, intravenous infusion of solutions is indicated. The base is considered to be a 10% glucose solution, which provides the body with energy. In case of hypoxic disorders, neoton administration is effective.

## Conclusion

The probability of complete recovery is high in full-term newborns without congenital malformations and immunodeficiencies. The prognosis is less favorable in preterm infants, especially when they require ventilated oxygen support. Prevention of neonatal pneumonia includes antenatal protection of

the fetus, timely diagnosis and treatment of infections in pregnant women, prevention of RDS by administering dexamethasone at a high risk of preterm birth.

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